cc: 1. RPM - Hmem
2. Site Repository
3. SF File Room
4. TAG File

Assistance Agreement No. 1-97631601-0

TAG QUARTERLY PROGRESS REPORT

Date:	July 27, 2005
Report Number:	9
Report Period:	April 1, 2005 to June 30, 2005
Site:	Pantex Superfund Site
Grant Recipient:	STAND, Inc.
Recipient Group Rep:	Pam Allison, Project Manager
Technical Advisor:	IEER: George Rice

PROGRESS ACHIEVED:

- STAND - Issued a Request for Proposals for Technical Assistance in toxicology to review the Pantex Baseline Risk Assessment Work Plan, the Ecological Baseline Risk Assessment, and the Baseline Risk Assessment addressing human health.

- STAND - Received proposals from persons or groups interested in the Technical Assistance work in toxicology for STAND under its TAG.

- STAND - Provided formally to EPA and TCEQ copies of a report produced by George Rice in response to the updates to the Risk Reduction Rule Guidance document submitted to the regulators by Pantex.

- STAND - Attended the quarterly Pantex Groundwater meeting on June 7 held at Panhandle, Texas, for Pantex' updates on the progress of environmental cleanup at Pantex.

DIFFICULTIES ENCOUNTERED:

- None.

PERCENT OF PROJECT COMPLETED TO DATE:

- 70 Percent

DELIVERABLES PRODUCED THIS QUARTER:

- STAND - Submitted George Rice's written report expressing concerns and shortcomings of DOE/BWXT revisions to the *Pantex Risk Reduction Rule Guidance to the Pantex Plant RFI* to EPA and TCEQ formally via mail.

- STAND - Submitted a formal letter of concern about inconsistent applications of risk-based standards to surface soils in the *Pantex Plant Final RCRA Facility Investigation* reports. STAND raised the community concern that Pantex had (1) designated soils as one category and applied standards from a different designation and (2) failed to justify its application of the standards.

ACTIVITY ANTICIPATED IN NEXT QUARTER:

- Evaluate the Proposals received in response to STAND's request seeking technical assistance from a toxicologist(s) to review the Pantex Baseline Risk Assessment documents.

- Select the best proposal submitted for the technical assistance in toxicology and secure a contractual agreement with the selected person or group.

- Begin reviews of the Baseline Risk Assessment Work Plan.

- Meet with representatives of EPA and TCEQ in a roundtable discussion in July.

- Participate in the quarterly groundwater meetings.

- Participate in the EPA public meeting discussing the Radionuclides Information Report, if the meeting is scheduled during this quarter.

Return to Listing

STAND
Call for Proposals

STAND is a non-profit organization that (under a technical assistance grant) is reviewing environmental reports and cleanup plans for the DOE Pantex Plant (near Amarillo, Texas) - a Superfund Site whose operations have resulted in documented contamination of the regionally important Ogallala Aquifer.

STAND seeks a toxicologist(s) to provide technical services for human health and ecological risk assessments. The primary focus of the Technical Advisor(s) will be to review the

- Baseline Risk Assessment Work Plan and
- Baseline Risk Assessment.

The total contract will be limited initially to $20,000; however, in the event that funds in the contract are expended and additional work remains to be completed, STAND may renew the contract with additional funds at that time.

To request the complete Statement of Work and/or to submit a proposal, contact:
STAND

Attn: Proposals, Technical Project
7105 W 34th Avenue, Suite E
Amarillo, TX 79109
Tel: (806) 358-2622
Fax: (806) 355-3837
stand@arn.net

Proposals must be received by STAND on or before 31 May 2005.

Posted 25 Apr 2005

Return to Listing

Opportunities for Research Fellowships at the European Commission's Joint Research Centre

Various opportunities exist for researchers to work at the European Commission's Directorate General Joint Research Centre (JRC) in support of the development and implementation of EU policy. These include PhD opportunities, post-doctoral positions, as well as visiting scientist fellowships. (see www.jrc.cec.eu.int and www.jrc.cec.eu.int/default) As an example, for fellowships to work at the JRC's Institute of Environment and Sustainability (IES) see http://ies.jrc.cec.eu.int/fellowship/.

The closing date for application for these particular PhD and post-doctoral IES fellowships is 30th September. There are many opportunities, ranging from atmospheric modelling, drought forecasting, ecological functioning, data mapping, LCA, ..., to many other projects in domains such as health effects, climate change, transport impacts, effects on ecosystems, ... In addition to making specific applications, we recommend those interested in such research opportunities to register their details in the ELSA database (http://elsa.cordis.lu/index.cfm).

Return to Listing

The National Exposure Research Laboratory Post-doctoral Program Job Opportunities

The National Exposure Research Laboratory (NERL) of the United States Environmental Protection Agency is seeking candidates to fill approximately 9 federal, four-year post-doctoral research positions. NERL's research encompasses areas such as environmental monitoring and characterization (physical, chemical, biological, and microbiological); computer modeling of the transport, transformation, and fate of pollutants in multiple media and at multiple scales; human and ecological exposure analysis (including the development of exposure biomarkers

STAND
Statement of Work for Technical Advisor(s) in Toxicology

Due date for submission of proposal: must be received by STAND by May 31, 2005

Submit Proposal to:

STAND
Attn: Proposals, Technical Project
7105 W. 34th Avenue, Suite E
Amarillo, TX 79109
(806) 358-2622; fax (806) 355-3837
stand@arn.net

STAND is a non-profit organization that (under a technical assistance grant) is reviewing environmental reports and cleanup plans that are being produced by the Department of Energy Pantex Plant (near Amarillo, Texas). Pantex is a Superfund Site and its operations have resulted in documented contamination of the Ogallala Aquifer.

STAND seeks to award one contract for technical assistance, as detailed below. The total contract will initially be limited to $20,000, which will include the maximum payment for both time spent on tasks requested by STAND under this project as well as allowable expenses that are incurred under this project (including completing and presenting the results in a public forum, if requested).

However, in the event that funds in the contract are expended and additional work remains to be completed, STAND may renew the contract with additional funds at that time.

To submit a proposal, please provide (1) Technical Proposal that includes

- your approach to conducting the work specified (maximum of 2 pages),
- vita/vitae of primary investigator(s),
- three references and their telephone numbers, and
- examples of relevant past work and projects.

And (2) Cost Proposal, as a separate submittal, that details

- costs per hour for primary investigator(s), and
- overhead costs, if applicable.

The Technical Advisor(s) with demonstrated expertise in human health and ecological toxicology and risk assessment will provide technical assistance to STAND relating to the Pantex Baseline Risk Assessment process and documents. The Pantex Baseline Risk Assessment Work Plan (approved, in part, by the regulators) establishes the methodology for the Pantex Baseline Risk Assessment. The risk assessment process is part of the Pantex cleanup that is underway and governed by the RCRA and CERCLA, the Environmental Protection Agency, and the Texas

Council on Environmental Quality. [Because Pantex had already begun its investigations under RCRA before being added to the NPL, its cleanup has been based on a combination of RCRA and CERCLA regulations.]

The primary focus of the Technical Advisor(s) will be to review the

FY05

- Baseline Risk Assessment Work Plan, and
- Baseline Risk Assessment.

However, information (included as chapters in the following RCRA Facility Investigation Reports) related to these two primary documents may warrant brief reviews of the following:

FY05-FY06

- Baseline Risk Assessment for the Burning Ground (May 2005)
- Baseline Risk Assessment for the Southeast Area (September 2005)
- Baseline Risk Assessments for Zone 10, Zone 11, and Zone 12 (soils and subsurface)
- Baseline Risk Assessment for the Ditches and Playas (soils and subsurface)
- Baseline Risk Assessment for Independent Sites (soils and subsurface)
- Baseline Risk Assessment for Groundwater
- Radionuclides Information Report (previously reviewed by STAND)
- Other unscheduled reports, that may be deemed relevant to this project

STAND will provide the documents to the Technical Advisor(s) for review, comments, and recommendations, on a task-by-task basis. The Technical Advisor(s) will consult with STAND as to time required for a specific task and scheduling, so that any scheduling or funding issues can be identified. If requested, the TA will then provide a draft report for STAND's review and comments. Additional peer-review may be requested for important or significant findings. Final reports will be edited and published by STAND for distribution to the public. For significant or important findings that deserve broader public discussions, STAND may request the TA to present and discuss the findings with the media and/or the public.

DELIVERABLES

- For each document reviewed, the TA will provide a brief letter of preliminary findings and concerns to STAND. STAND will provide a copy of each TA deliverable to EPA.
- If requested by STAND, the TA will provide a draft report for review and comments.
- In consultation with STAND, the TA will address comments and provide a draft final report.
- If STAND considers the report findings to be of sufficient importance to the community, STAND may request a peer-review of the report prior to publication.
- If STAND considers the report findings to be of sufficient importance to the community, and timing of the findings is relevant to the regulators' schedule, STAND may submit the TA's technical comments to representatives of the EPA and TCEQ.

- If STAND considers the report findings to be of sufficient importance to the community, STAND may request that the TA present and discuss the findings with the media and/or the public.
- If requested by STAND, the TA will attend and participate in public information meetings such as the quarterly (previously monthly) groundwater meetings held by Pantex and the state regulatory agency.
- STAND will hold a minimum of two public meetings per year in which it presents and distributes information to the public that it has gained through its review process.

FILE

STAND

May 17, 2005

STAND, INC.
7105 W. 34th, Ste E
Amarillo, TX 79109

Phone: (806)358-2622
Fax: (806)355-3837
Email: stand@arn.net

Jackie Hardy, Division Director
Texas Commission on Environmental Quality
MC-127
PO Box 13087
Austin, Texas 78711-3807

Re: Pantex Plant Risk Reduction Rule Guidance (RRRG) document, amendments proposed by DOE (March 2004) and currently under review by TCEQ

Dear Ms. Hardy:

Attached are STAND's comments based on its technical review of the above named proposed amendments. These proposed amendments were submitted to you by DOE in response to technical concerns expressed by your staff.

Protecting the regionally important Ogallala Aquifer is important to Panhandle residents. The proposed amendments to the RRRG document will play a major role in the success – *or failure* – of meeting this goal.

On behalf of concerned residents of the Texas Panhandle, I appreciate your considering our expectations that the investigations and cleanup decisions be made in a technically-sound manner. Your staff is a critical component in realizing our expectations.

Sincerely,

Tonya Kleuskens

Tonya Kleuskens, President

Attachment

Cc: Mr. Robert Musick, TCEQ, MC-127, PO Box 13087, Austin, Texas 78711-3807
Ms. Camille Hueni, Superfund Division, TX Section (6SF-AP), USEPA Region 6,
1445 Ross Avenue, Dallas, TX 75202-2733
Mr. Dan Glenn, DOE/NNSA, PO Box 30030, Amarillo, TX 79120-0030

Evaluation of the Department of Energy's revised *Risk Reduction Rule Guidance to the Pantex Plant RFI*, March 2004

George Rice, March 2005

This is an evaluation of the Department of Energy's (DOE) revised *Risk Reduction Rule Guidance to the Pantex Plant RFI* (RRRG, March 2004)[1]. The RRRG is a revision of DOE's April 2002 RRRG document[2].

This evaluation was performed on behalf of Serious Texans Against Nuclear Dumping (STAND), a non-profit organization of concerned citizens.

One of the major purposes of the RRRG is to determine background concentrations of contaminants in the Ogallala Aquifer at the Pantex Plant[3]. Background concentrations are also referred to as Risk Reduction Standard 1 (RRS 1) concentrations[4]. These background concentrations, once accepted by the State of Texas, will be used to define the amount and areal extent of groundwater contamination associated with the Pantex Plant. Cleanup will not be required in areas where contaminant concentrations are less than background[5].

STAND evaluated DOE's earlier RRRG document[6]. Many of the problems identified in the earlier document remain in the revised document. Those problems are briefly outlined below. Additional information is contained in STAND's earlier evaluation.

- Some of the wells used to establish background concentrations are on Pantex property or down gradient of Pantex. Thus, they may have been affected by contaminants emanating from the Plant.

- Contaminants associated with Pantex have been found in wells used by the DOE to establish background concentrations.

- Some of the wells used to establish background concentrations appear to be completed in both the Ogallala Aquifer and the Dockum Group. Samples from these wells will be a mixture of waters from both units and, thus, will not be representative of water quality in the Ogallala Aquifer alone.

- The DOE appears to have used analyses of unfiltered samples to establish background concentrations for metals. Use of unfiltered samples

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[1] DOE, 2004a, see references.
[2] DOE 2002a.
[3] DOE 2002a, page 2 and table 3-6. The background concentrations established for the Ogallala Aquifer will also be applied to the perched aquifer (DOE 2004a, page 23).
[4] DOE 2004a, page 1.
[5] DOE 2004a, page 1.
[6] STAND 2003a.

can result in estimates of metal concentrations that are higher than actual concentrations.

- The DOE has not used the most sensitive analytical method to analyze background samples. This has resulted in the establishment of background concentrations for some man-made contaminants that equal or exceed health-based standards.

- The DOE has overestimated the background concentration of thallium by a factor of more than 75.

- The DOE has overestimated the background concentration of chromium by a factor of more than four.

The following sections discuss problems identified in DOE's revised RRRG document.

Revised background concentrations

The background concentrations of metals in groundwater that were established in the April 2002 RRRG are unchanged in the March 2004 RRRG[7].

However, DOE has changed some background concentrations (RRS 1) for organic compounds in groundwater[8]. All of the changes are increases. That is, they may result in a lesser degree of protection and cleanup than would be required under the original values. The changes are listed in the table 1.

Table 1
Changes in Background Concentrations (RRS 1) for Organic Compounds

Compound	April 2002 value (µg/L)	March 2004 value (µg/L)	Percent increase
benzene	2.5	3.0	20
carbon disulfide	2.5	5.0	100
carbon tetrachloride	2.5	3.0	20
dibromomethane	2.5	3.0	20
isobutyl alcohol	250	1000	400

The RRS 1 values were increased because the practical quantitation limits (PQLs) for these compounds were increased. The PQL is considered background for contaminants that do not occur naturally[9]. The PQL is defined as the: "*lowest concentration of an analyte which can be reliably quantified within*

[7] DOE 2002a, table 3-6 and DOE 2004a, table 3-6.
[8] DOE 2002a, table 3-13 and DOE 2004a, table 3-13.
[9] DOE 2004a, page 10.

specified limits of precision and accuracy during routine laboratory operating conditions."[10] The PQL is not the same as the analytical detection limit. For water samples, DOE set the PQL at five times higher than the detection limit[11].

The revised RRRG document does not provided any explanation for the changed PQL/background values. No changes should be accepted until DOE provides an adequate reason for the change.

DOE also revised a number of RRS 2 concentrations (e.g., 1,1-dichloroethane, acetone, PETN). Again, the revised RRRG does not provide any explanation for the changed values. They should not be accepted until DOE provides an adequate reason for the changes.

Justification of chromium values

The Texas Commission on Environmental Quality (TCEQ) instructed DOE to justify the inclusion of the two highest chromium values (31.8 µg/L and 7.1 µg/L) or remove them from the background data set[12]. DOE did not remove them.

DOE's justification for retaining the chromium values is: "*Consistent with Ogallala Wells Owned by Adjacent Landowners*"[13]. And, in a footnote DOE states: "*Ogallala groundwater backgrounds were developed from data collected only in wells supported by documented completion/construction logs. Data from many Ogallala wells completed in areas adjacent to the Pantex Plant, including neighboring landowner wells, could not be included because a document completion/construction log could not be located. Nevertheless, the concentrations of some constituents, such as chromium, may appear to be outliers in the data set used, but are clearly within the range of concentrations observed when these other Ogallala well data are considered."*[14]

The revised RRRG contains no further explanation for retaining the chromium values. Nor does it provide any information concerning the locations of the wells or the concentrations of chromium and other analytes in samples collected from these wells.

DOE and TCEQ have established criteria for background wells[15]. One criterion is: "*Well installation and lithologic information are available for the wells*". This information does not appear to be available for the wells owned by adjacent landowners.[16] Therefore, the use of data from these wells violates the criteria

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[10] DOE 2004a, page 28.
[11] DOE 2004a, page 28
[12] TCEQ, 2003, pages B-10 and B-11. Both of these results are from well PTX08-1011A.
[13] DOE 2004a, table C3-1.
[14] DOE 2004a, footnote to table C3-1.
[15] DOE 2004a, pages C-1 and C-6.
[16] DOE 2004a, footnote to table C3-1.

agreed upon by DOE and TCEQ. Data from these wells should not be used to determine background concentrations.

Perchlorate analyses

DOE has lowered the PQL for perchlorate from 20 µg/L to 12 µg/L[17]. However, in the last few years a more sensitive analytical technique has been developed (LC/MS/MS, LC/ESI-MS/MS). The detection limits for this technique are 0.5 µg/Kg and 0.05 µg/L for soil and water, respectively[18]. Assuming a PQL equal to five times the detection limit, the PQL for water would be 0.25 µg/L. This is more than 40 times lower than DOE's PQL for Pantex.

The new method is being used by Los Alamos National Laboratory (LANL) and the State of New Mexico to determine background concentrations of perchlorate in groundwater beneath the Pajarito Plateau. LANL and the State are reporting perchlorate concentrations as low as 0.09 µg/L[19].

When determining the extent of contamination, DOE is required to use the "*most sensitive standard available method for the contaminant in the specified medium*".[20] DOE should use the new analytical technique at Pantex

VOCs - inhalation and dermal contact during showering

In calculating media-specific concentrations (MSCs)[21] for volatile organic compounds (VOCs) in groundwater, the previous RRRG considered exposure through inhalation and dermal contact during showering[22]. This consideration has been removed from the revised RRRG. That is, when calculating the MSC, the RRRG no longer considers the risk associated coming into contact with, or inhaling VOCs[23].

DOE should explain why it no longer will consider the risk associated with exposure to VOCs during showering.

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[17] Compare tables 3-13 in DOE 2002a and DOE 2004a.
[18] EPA, 2005a, page 1; and Winkler et al., 2004.
[19] Dale et al., 2004.
[20] DOE 2004a, page 28.
[21] MSCs are health-based standards. MSCs are calculated for individual contaminants in each exposure pathway (DOE 2004a, pages 31 - 33).
[22] DOE 2002a, pages 35 – 37.
[23] DOE 2004a, pages 35 - 36.

References

Dale, M.R., K.P. Graznow, S.M. Yanicak, D. Englert, P. Longmire, D. Counce, 2004, *Trace Perchlorate in Ground Waters of the Pajarito Plateau, Espanola Basin and the Rio Grande North of Taos, New Mexico – Status Summary, Plate 2 – Selected Stations and Results for the Determination of Background Perchlorate in Ground Water, Surface Water, and Precipitation, Pajarito Plateau*, July 2004.

DOE, 2002a; *Risk Reduction Rule Guidance to the Pantex Plant RFI*, Final Report, April 2002.

DOE, 2004a; *Risk Reduction Rule Guidance to the Pantex Plant RFI*, Final Report, March 2004.

EPA 2005a, Recent *Developments in Analytical Methods for Emerging Contaminants*, in Technology News and Trends, Issue 16, January 2005, URL: http://www.clu-in.org/download/newsltrs/tnandt0105.pdf

STAND, 2003; *Background Concentrations of Contaminants in the Ogallala Aquifer at Pantex, An Evaluation*, STAND Technical Report 2003-1, May 2003.

TCEQ, 2003, *Conditional Approval, Final Risk Reduction Rule Guidance (RRRGD) to the Pantex Plant RFI, Dated April 2002*, June 23, 2003.

Winkler P., Minteer M., Willey J., 2004, *Analysis of perchlorate in water and soil by electrospray LC/MS/MS*, Anal Chem. 2004 Jan 15;76(2): 469-73, URL: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14719899

FILE

STAND

May 17, 2005

Jackie Hardy, Division Director
Texas Commission on Environmental Quality
MC-127
PO Box 13087
Austin, Texas 78711-3807

Re: Inconsistent applications of risk-based standards to surface (0 to 2 ft below-ground-surface) soils in ***Pantex Plant Final RCRA Facility Investigation*** reports that seek to address its contaminated soils.

Dear Ms. Hardy:

This letter is to express STAND's concerns that the evaluations of surface soils – those soils between 0 and 2 feet below ground surface – have not been conducted consistently or accurately.
STAND originally expressed these concerns to you by letter (July 16, 2004).

Since that time, STAND has raised the concern in quarterly groundwater meetings with the US Department of Energy (DOE) so that it could be discussed in a public forum. At the last quarterly groundwater meeting, DOE stated that it did not understand the community's concern, and offered to meet with us at the Region I TCEQ office. This meeting took place on March 24, 2005.

At the end of the meeting, DOE and its contractors understood the concerns that we expressed. In summary, the concerns are that:

- DOE's evaluation of contaminated soils between 0 and 2 ft below-ground-surface requires the designation of "U-upland soils" unless the soils had been replaced by borrow-fill, in which case the designation would be "B-Blackwater Draw soils." This application is defined by DOE in its Risk Reduction Rule Guidance document.
- DOE applied the designation of "U" (upland soils) to some of its data from samples of its surface soils; however, it incorrectly applied the concentration thresholds for "B" (borrow fill).
- In other cases, DOE applied "B" (borrow fill) designation and the corresponding concentration thresholds for "B."
- In no cases did STAND encounter any discussion in any of the reports in which DOE justified that the soils under consideration were – indeed – borrow-fill, rather than native soils.
- Data points which should have been carried forward in DOE's analyses to determine the footprint of contaminated soils were not carried forward. Thus, the contaminant footprints do not accurately reflect their analytical results and minimize the actual surface area of contamination. Neither cleanup nor administrative controls will be required, based on these errors.

STAND, INC.
7105 W. 34th, Ste E
Amarillo, TX 79109

Phone: (806)358-2622
Fax: (806)355-3837
Email: stand@arn.net

As you know, these reports are required to be stand-alone documents and should contain the necessary information for any technical reviewer to conduct a complete and thorough evaluation of their process. This has not been our experience.

The ramifications for these inaccuracies were of the most concern for the contaminant metals Barium and Strontium. STAND's review of only one of DOE's investigations (*Final RCRA Facility Investigation Report for Independent Sites at USDOE Pantex Plant*) identified 429 analytical results for surface soils that DOE either (1) inaccurately applied the wrong threshold, or (2) failed to make the case that the soils were borrow-fill, which would justify applying the much higher thresholds in their data review of surface soils regarding the contaminant metals Barium and Strontium.

Once he recognized the discrepancies in their reports, DOE's representative, Jerry S. Johnson, committed to me at the March 24 meeting that they would investigate and provide a written response to STAND regarding this matter. As of this date, STAND has not received a response. He also stated that it would be added to the agenda of the next quarterly groundwater meeting.

Thank you for considering our concerns about this matter. These errors represent a difficult concept to explain in a letter; however, we would be glad to meet with you at your office to explain and go through the actual data-sets for the DOE cleanup documents so that we can more-easily explain it using the actual data sets. This is important because the problem will be underestimated, cleanup will be incomplete and the commitment to the public will not be upheld.

Sincerely,

Tonya Kleuskens, President

Tonya Kleuskens

Cc: Mr. Robert Musick, TCEQ, MC-127, PO Box 13087, Austin, Texas 78711-3807
Ms. Camille Hueni, Superfund Division, TX Section (6SF-AP), USEPA Region 6,
1445 Ross Avenue, Dallas, TX 75202-2733
Mr. Dan Glenn, DOE/NNSA, PO Box 30030, Amarillo, TX 79120-0030

PARSONS

290 Elwood Davis Road, Suite 312 • Liverpool, NY 13088 • (315) 451-9560 • Fax (315) 451-9570 • www.parsons.com

April 28, 2005

Terry J. Moore
Atlantic Richfield Company
1701 Summit Avenue, Suite 2
Plano, Texas 75074-8175

RE: Sands Springs Riverbank Sludge Removal
Rip-Rap Design
Sands Springs, OK

Dear Mr. Moore:

Excavations for the Riverbank Sludge Removal project at the Sands Springs Petrochemical Complex in Sands Springs, Oklahoma resulted in increased volume and extent compared to the plan submitted in September 2004. Re-establishing the riverbank slopes to the previously existing relatively steep grades would require substantial volumes of imported fill. Atlantic Richfield proposes to backfill these slopes to flatter overall angles which will also provide the benefit of reducing the erosion potential of these slopes with respect to both surface runoff and river flow. In an additional step to increase erosion resistance, Atlantic Richfield has also used an off-site source of alternative clayey shale backfill material instead of the on-site sands.

Atlantic Richfield is submitting this letter describing the proposed riverbank backfill and erosion protection modifications. Atlantic Richfield believes that these modifications will improve the appearance and functionality of the riverbank restoration at the completion of the Riverbank Sludge Removal project.

The current configuration of the Sludge Removal Area is shown on the attached Figures 1 and 2. The attached cross-sections in Figures 3 through 6 show the expected final geometries of the riverbank slope in the area subject to the sludge removal. These cross-sections show that the lower section of the slope immediately above the normal water level will be graded at slopes of 10H:1H or flatter. These areas will be backfilled with at least 2 feet of the compacted clayey shale material. The middle portions of the site have relatively smooth contours vertically and laterally as shown in Cross-Section A-A'. The lack of a steep slope along the riverbank should reduce the potential for localized turbulent flow that could cause scour. There will be a low slope "step" along the upstream edge that marks the transition from the fill and sludge removal area to the adjacent lowlands as shown in Cross-Section B-B'. Atlantic Richfield recognizes that this transition may cause localized scour forces that require additional protection as discussed below. Similarly, the downstream edge of the fill and sludge removal area is marked by an existing bluff as show in Cross-Section C. This transition will also have additional protection as discussed below.

The on-site fine to medium sands that have been excavated with the sludge are relatively erodible. A typical permissible velocity of about 2 feet per second (fps) for these sands is provided in the attached Table 2-5 from USACE EM 1110-2-1601 *Hydraulic Design of Flood Control Channels*. The original work plan called for backfilling the site back to the original grades with these poor-quality sandy fill materials. Rip-rapping the entire slope exposed to flow was also proposed and approved to protect these sands against the erosion and piping that naturally occurs in the river system.

Since the erosion potential of the existing fine sands was very high and the sludge excavation volumes increased substantially beyond expectations, Atlantic Richfield has used this opportunity to reassess the approach to permanent erosion control. The use of more erosion resistant backfills will require less protection from an additional surface layer and will provide redundant erosion protection to the underlying materials due to the increased erosion resistance of the backfill compared to the fine sands.

The off-site backfill source of clay provides an alternative approach to erosion protection. The attached laboratory test results show that clay is classified as a low-plasticity clay (CL) with the "highest resistance to erosion" as presented in the attached Figure 6 from USACE TM 5-818-8 *Engineering Use of Geotextiles*. The clay is expected to have a permissible velocity of about 6 fps compacted in place and up to about 8 fps if vegetated with grass or similar plants.

The highest expected traction shear stresses are expected to be in the lower part of the water column during a flood event. Atlantic Richfield proposes to install the previously agreed to rip-rap maximum 15-inch size along the river bank from below the water line to just above the normal water line. However, the greatly increased erosion resistance of the proposed clay backfill material compared to the on-site sands indicates that the geotextile is not required as the clay alone should have sufficient erosion resistance to most of the design flood conditions even without the proposed rip-rap protection. Instead the rip-rap will be installed and compacted into the clay surface so that the materials have intimate contact and the varying sized of the rip-rap can be locked into position with each other. More energy can be put into placing and compacting the rip-rap because damage to the geotextile will not be an issue. The rip-rap thickness will be about 24 inches with a maximum size of 15 inches. While most of the rip-rap will be in the range of 12 to 15 inches, smaller rip-rap pieces will be allowed to allow many of the interstitial voids to be filled to increase resistance to water flow in the rip-rap pore space and further reduce water velocities at the soil interface. We note that this will result in a greater average rock density per square yard than would be the case with a uniform gradation.

Above the rip-rap elevation, the clay would be vegetated with a combination of grasses and other native vegetation. Atlantic Richfield will be pleased to discuss the specific species to be used in this portion of the restoration to maximize environmental restoration of this stretch of the riverbank. The revegetation could include livestaking of willows and the planting of desirable tree and shrub seeds and seedlings. The vegetated

area will be flooded infrequently and it is expected that a very healthy stand of vegetation can be established that will reduce water velocities and maintain very good erosion resistance.

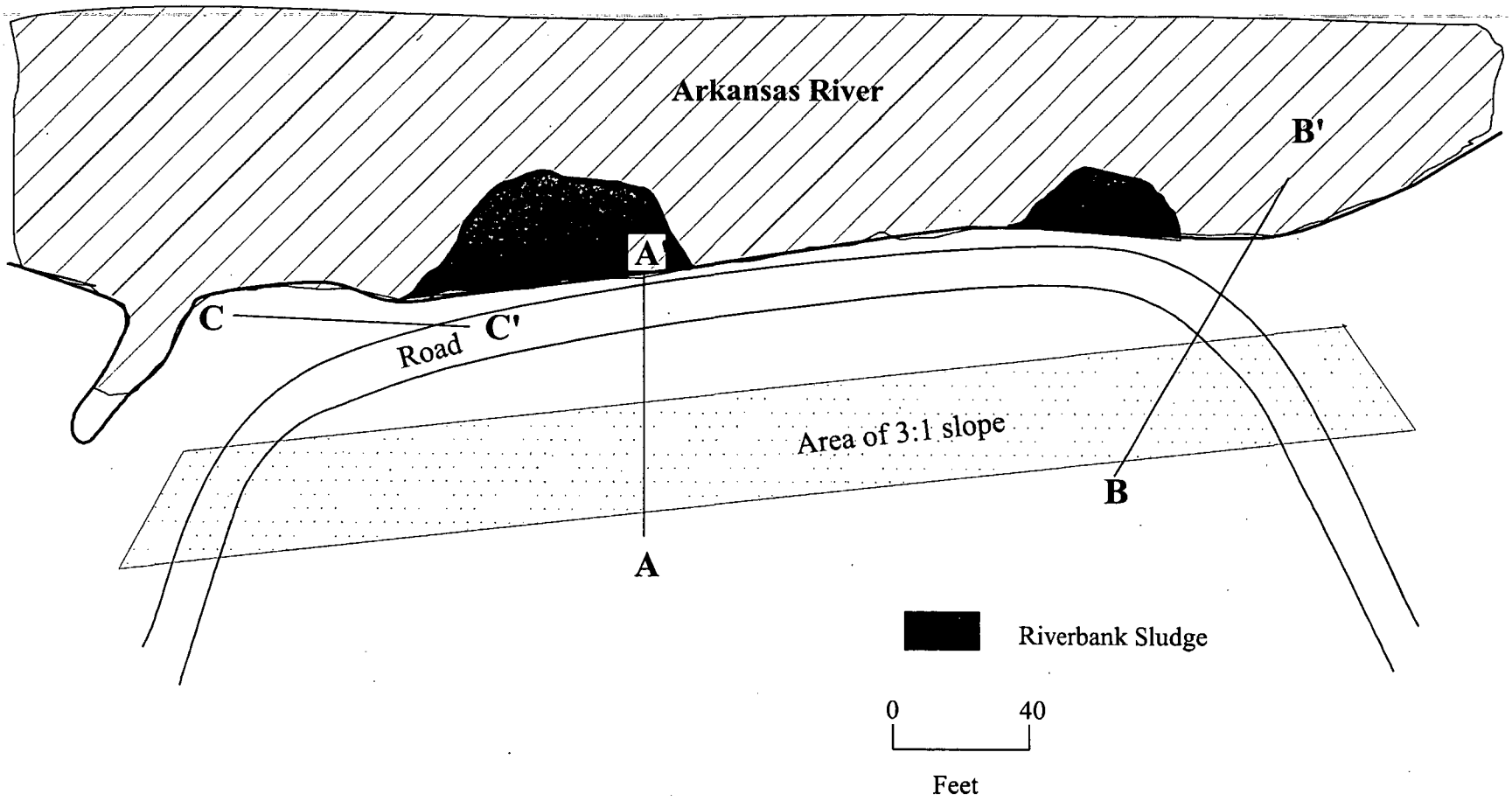
Erosional effects to the upstream and downstream ends of the Riverbank Sludge Removal Area have been considered during the proposed design modifications. Atlantic Richfield recognizes that the areas immediately upstream and downstream of the excavation areas consist of more erodible on-site sands. In addition, geometries at either end of the area could potentially cause turbulent flow that could cause scour of unprotected soils. Atlantic Richfield proposes to protect the upstream and downstream ends of the Sludge Removal Area with the rip-rap design that was approved in the original workplan. For the upstream section, riprap would be placed along the slope immediately above the unexcavated wetlands from the rivers edge to about 40 feet inland (schematic diagram Figure 4). This sand slope in this location is several feet high and is likely to be subject to relatively intense flows due to the relatively abrupt change in height. Prevention of erosion at this particular location should prevent the effects of downstream erosion in the Riverbank Sludge Area. Similarly, at the downstream end of the Sludge Excavation Area there are steep sand slopes that are currently subject to erosion during flood events. These areas will also be protected by rip-rap underlain by geotextile (schematic diagram in Figure 5). The slopes will be graded as appropriate for placing rip-rap. The design details of these upstream and downstream areas are contained in Figure 2 of Appendix D of the previously approved September 2004 Work Plan prepared by D&B Construction for this Site.

Sincerely,

PARSONS

Raymond D. D'Hollander
Principal Project Engineer

Attachments: Figures
Laboratory Data
Table 2-5



Plan View of Area of Sludge Removal, Rip Rap and Revegetation (Scale is approximate)

FIGURE 1

Atlantic Richfield
Sand Springs Petrochemical Complex

PLAN VIEW OF AREA
OF SLUDGE REMOVAL

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

P:\441310\cad\cross-section plan view.dwg, 4/25/05, CLW
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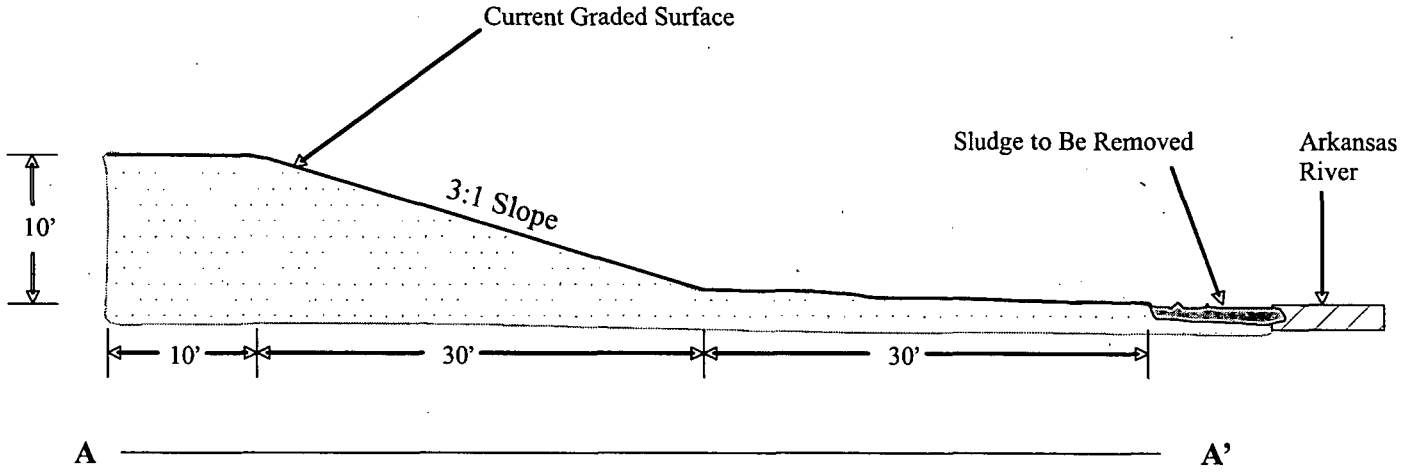

Cross Section A– A'

Current Topographical Surface

FIGURE 2

Atlantic Richfield
Sand Springs Petrochemical Complex

CROSS–SECTION A–A'

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P:\441310\cad\cross–section A–A'.dwg, 4/25/05, CLW
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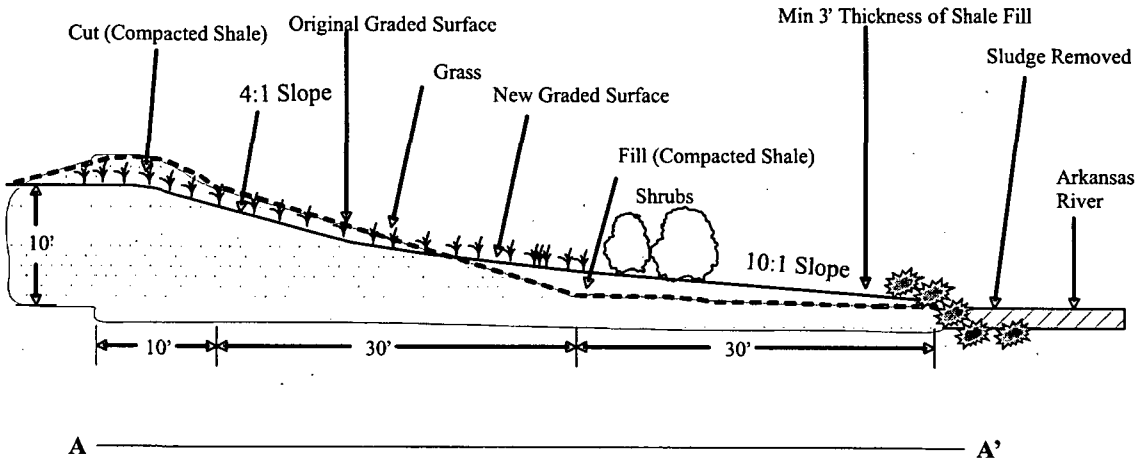

Cross Section A– A'

Area to be Filled and Compacted with Shale

FIGURE 3

Atlantic Richfield
Sand Springs Petrochemical Complex

CROSS–SECTION A–A'

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P:\441310\cad\cross–section modification A–A'.dwg, 4/25/05, CLW
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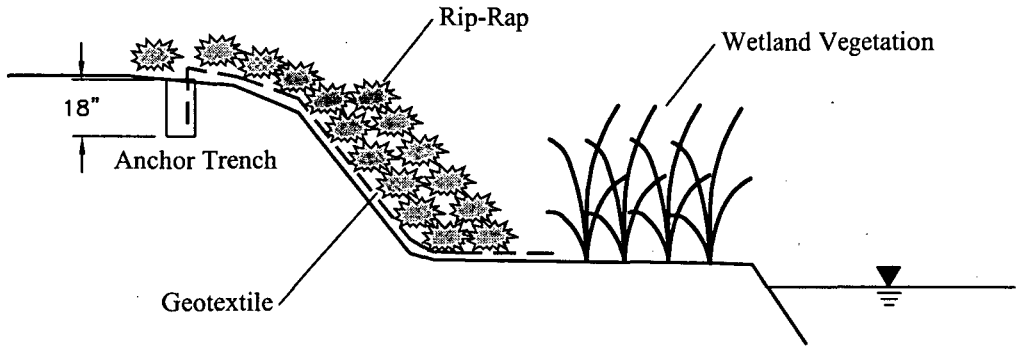

B ——— **B'**

Cross Section B– B'

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No XREFs

FIGURE 4

Atlantic Richfield
Sand Springs Petrochemical Complex

CROSS–SECTION B–B'

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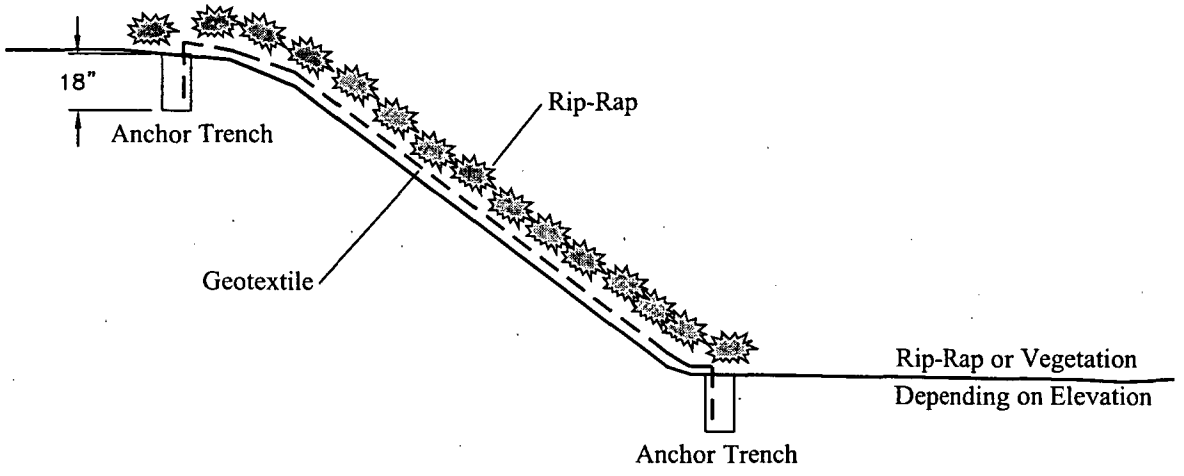

C C'

Cross Section C– C'

FIGURE 5

Atlantic Richfield
Sand Springs Petrochemical Complex

CROSS–SECTION C–C'

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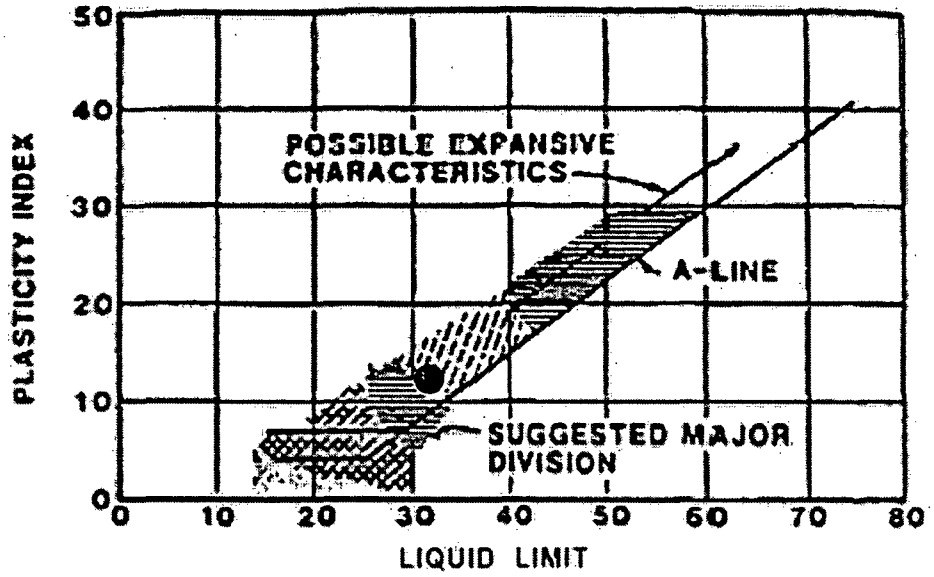

EXPLANATION

- HIGHEST RESISTANCE TO EROSION
- SLIGHT EROSION EXPECTED
- MODERATE EROSION EXPECTED
- LOW RESISTANCE TO EROSION

SUGGESTED TREND OF EROSION CHARACTERISTICS FOR FINE-GRAINED COHESIVE SOILS WITH RESPECT TO PLASTICITY

Figure 6-1. Relationship between Atterberg Limits and Expected Erosion Potential

LEGEND:

● SHALE BACKFILL ATTERBERG LIMITS FROM LABORATORY TESTING

NOTE:

FIGURE ADAPTED FROM: USACE TM 5-818-8 ENGINEERING USE OF GEOTEXTILES (1995)

FIGURE 6

Atlantic Richfield
Sand Springs Petrochemical Complex
SHALE BACKFILL
EROSION CHARACTERISTICS

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

P:\441310\cad\EROSION CHARACTERISTICS.dwg, 4/25/05, CLW
No XREFs

A & M ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
10010 E. 16TH STREET
TULSA, OK 74128-4813
ENGINEERING - ENVIRONMENTAL - CONSTRUCTION
TEL. (918) 665-6575 FAX (918) 665-6576

SIEVE ANALYSIS

PERFORMED FOR: D & B Construction Company, Inc. PROJECT NO.: 1909-001
LOCATION: Sand Springs Petrochemical Complex Project, Sand Springs, OK. SOIL SAMPLE WT.
BORING NO.: SAMPLE NO.: L-3161 TARE NO.:
DESCRIPTION OF SOIL: Shaley Lean Clay, Brown WT. TARE +
PERFORMED BY: MBB DEPTH: DRY SOIL, g:
DATE OF TEST: February, 2005 WT. TARE, g:
WT. DRY SOIL, g:

SIEVE NO.	SIEVE OPENING (mm)	WT. SIEVE (lb)	WT. SIEVE + SOIL, (lb)	WT. SOIL RETAINED, (lb)	PERCENT RETAINED	CUMULATIVE % RETAINED	PERCENT FINER
3/8"	9.5						93.0
#4	4.75						86.6
#10	2.00						79.5
#40	0.425						71.5
#100	0.15						66.7
#200	0.075						60.3

Laboratory Compaction Characteristics of Soil

Client Name: D & B Construction, Inc.
Project Name: Sand Springs Petrochemical Complex
Location:
City & State: Sand Springs, Oklahoma

Source Material: Off-Site Borrow
Sample Description: Shaley Lean Clay trace Sandstone
Brown
Material Designation: L-3161 Sample Date: Jan., 2005
Test Method: A
Test Procedure: ASTM D-698
Sample Preparation: Air-Dried
Rammer: ___ Mechanical X Manual

Project No.: 1909-001 Date: Feb., 2005

TEST RESULTS
Maximum Dry Unit Wt.: 109.0 pcf
Optimum Water Content: 17.2 %

Liquid Limit: 31 Plastic Limit: 19
Plasticity Index: 12
% passing # 200 sieve: 60.1

Reviewed by: MBB

Zero a r voids for specific gravity of 2.68

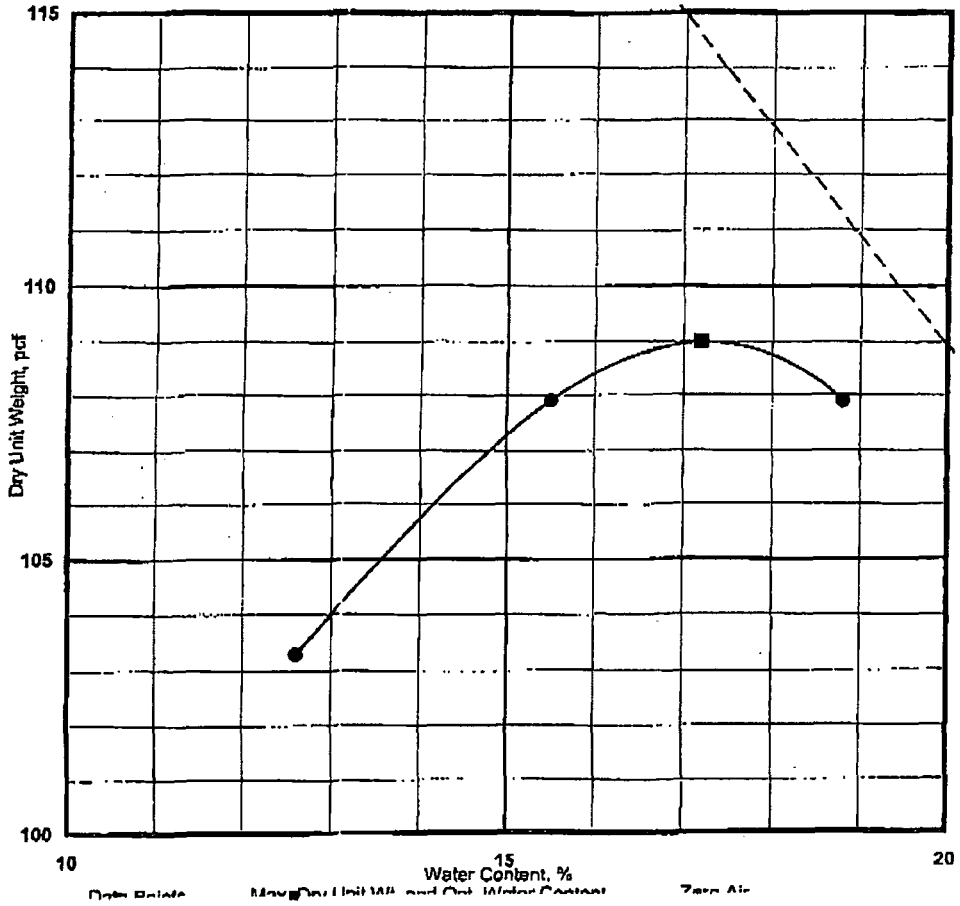

Table 2-5
Suggested Maximum Permissible Mean Channel Velocities

Channel Material	Mean Channel Velocity, fps
Fine Sand	2.0
Coarse Sand	4.0
Fine Gravel[1]	6.0
Earth	
Sandy Silt	2.0
Silt Clay	3.5
Clay	6.0
Grass-lined Earth (slopes less than 5%)[2]	
Bermuda Grass	
Sandy Silt	6.0
Silt Clay	8.0
Kentucky Blue Grass	
Sandy Silt	5.0
Silt Clay	7.0
Poor Rock (usually sedimentary)	10.0
Soft Sandstone	8.0
Soft Shale	3.5
Good Rock (usually igneous or hard metamorphic)	20.0

Notes:
1. For particles larger than fine gravel (about 20 millimetres (mm) = 3/4 in.), see Plates 29 and 30.
2. Keep velocities less than 5.0 fps unless good cover and proper maintenance can be obtained.